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Colorado Aquifer Exemptions:

Program that Sacrifices Underground Drinking Water for Oil and Gas Injection Raises Questions

The aquifer exemption program in the Safe Drinking Water Act (SDWA) Underground Injection Control (UIC) program allows certain oil and gas and mining activity to occur in groundwater that would otherwise be protected as a potential drinking water source.

Despite the high stakes of sacrificing potential drinking water for the sake of fossil fuel development, aquifer exemption programs at both the state and federal levels have suffered from inadequate funding and poor implementation. Aquifer exemptions have played a significant role in the growth of U.S. oil and gas production, eliminating the regulatory protections for groundwater that would otherwise slow or stop drilling.

Clean Water Action's work examining state and federal aquifer exemption programs pushed the U.S. Environmental Protection Agency (EPA) to increase oversight, including the creation of the first-ever inventory and map of exemptions across the country.[1] This increased transparency has enabled new analysis and scrutiny of state aquifer exemption programs. This analysis examines aquifer exemptions in Colorado associated with oil and gas injection activity, building on our existing body of work investigating and advocating for aquifer exemption reform in California,[2] Texas,[3] Oklahoma[4] and at EPA.[5]

We found that in order to adequately protect underground sources of drinking water (USDWs) in Colorado regulators must apply greater oversight to this program, beginning with improved data management and enhanced geologic review of exempted aquifers.

Aquifer Exemptions and Class II Injection in Colorado

The Colorado Oil and Gas Conservation Commission (COGCC) regulates oil and gas wells in the state. In 1984, EPA granted primacy to COGCC to administer the UIC Class II program, which includes the permitting and inspecting of oil and gas related injection wells used for both wastewater disposal and enhanced oil recovery.[6] As part of its role regulating the industry, COGCC provides public data on oil and gas wells.[7]

EPA's national aquifer exemption database and map, when combined with COGGC injection well data and Colorado regulations, reveals a state program that needs further scrutiny and reform.

1 US Environmental Protection Agency. "Aquifer Exemptions Map" https://www.epa.gov/uic/aquifer-exemptions-map

2 Clean Water Action/Clean Water Fund. "Underground Injection: Oil and Gas Wastewater Disposal and Enhanced Recovery" https://cleanwater.org/features/underground-injection-oil-and-gas-wastewater-disposal-and-enhanced-recovery

3 Clean Water Action/Clean Water Fund. "Texas Aquifer Exemptions: Ignoring Federal Law to Fast-Track Oil and Gas Drilling" August 2016. https://www.cleanwateraction.org/sites/default/files/docs/publications/Texas%20Aquifer%20Exemptions%20-%20Clean%20Water%20Action%20August%202016.pdf

4 Clean Water Action/Clean Water Fund. "Oklahoma Drinking Water at Risk from Oil and Gas Injection Wells" Spring 2017. https://www.cleanwateraction.org/sites/default/files/docs/publications/Oklahoma%20UIC%20-%20Clean%20Water%20Action%20-%20spring%202017.pdf

5 Clean Water Action/Clean Water Fund. "Aquifer Exemptions: A first-ever look at the regulatory program that writes off drinking water resources for oil, gas and uranium profits" January 2015 https://www.cleanwateraction.org/sites/default/files/docs/publications/Aquifer%20Exemptions%20-%20Clean%20Water%20report%201.6.15.pdf

6 "Underground Injection Control Program Memorandum of Agreement for Program Delegation between the Colorado Oil and Gas Conservation Commission and the United States Environmental Protection Agency Region VIII" August 15, 1989. https://cogcc.state.co.us/documents/gov/federal/CO142_%20Revised_MOA_Aug1_-89.pdf

7 Colorado Oil & Gas Conservation Commission. Data Download website: https://cogcc.state.co.us/data2.html#/download

COGCC Rule 324B specifies how an operator may obtain an aquifer exemption for Class II injection.[8] The process described in this regulation, however is in need of an update, relying on a lax approval process. For example, "Rule 324B.d. Aquifer exemptions designation" states, "If, within thirty (30) days after publication of the notice described in subparagraph b. above, the Commission does not receive a hearing request or receives a hearing request for which the Director determines the criteria set forth in Rule 324B.a. have been met, said aquifer or portion thereof shall be considered exempted thirty (30) days after publication of the notice." This passive approval scheme for exemptions is wholly inadequate for removing protections for a potential drinking water source. At a minimum, each exemption must require a positive determination and a public hearing that includes consultation with stakeholders such as water districts, nearby residents, and other members of the public, prior to being sent to EPA for review and final approval. COGCC should also review and update the exemption criteria in the Rule 324B., to reflect the current realities of water use, population trends, and climate change.[8]

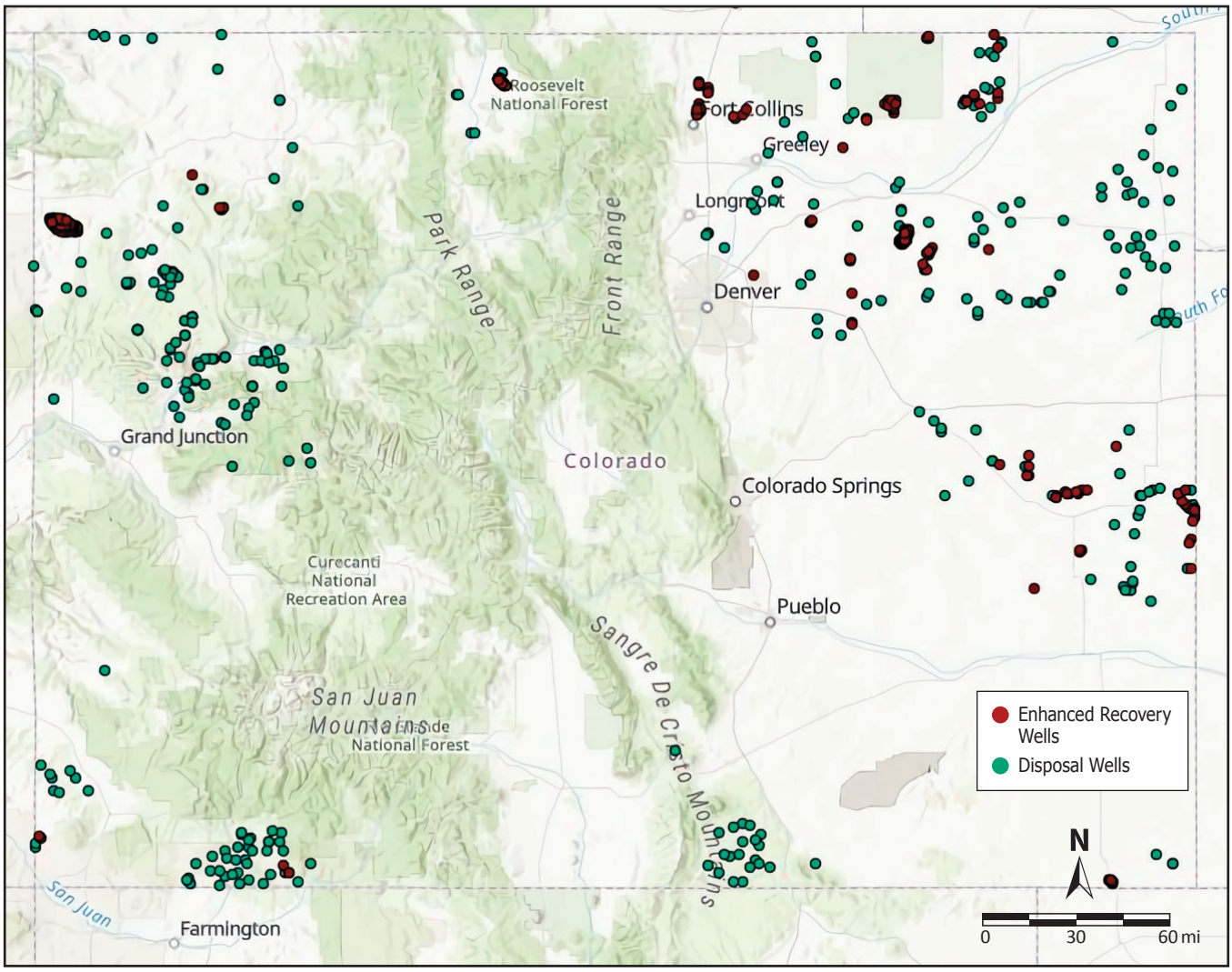
Data sources for this report: All data used in this analysis and to create these maps is publicly available from EPA and COGCC. Aquifer exemption spatial data is available from EPA for download and to examine in an online mapping tool. Individual injection well locations and data was provided by COGGC staff. COGCC website has shapefiles available for download and an online mapping tool, however the downloadable data was incomplete and data used in this report was provided upon request by staff.

Despite being the primary regulator of injection wells and exempt aquifers in Colorado, COGCC does not keep an inventory or maps of aquifer exemptions. Knowing which groundwater must be protected and which is exempt is necessary information for the agency charged with protecting underground sources of drinking water from injection. The fact that COGCC does not have a list or maps of exempt aquifers is a significant gap in regulatory oversight. For example, a UIC permit reviewer cannot cross reference an operator's claim that an exemption exists with state data, and would instead have to rely on industry-supplied information or imprecise analysis of nearby UIC permits to validate such a claim.

EPA data on exempt aquifers in Colorado is inadequate as well. Key data fields are either missing or do not reflect robust geologic analysis. Similarly the state's oil and gas well database is missing key information. COGCC keeps records of all oil and gas wells including injection wells in its online database. However poor data management systems make conducting statewide injection well analysis challenging. For example, the dataset available for download does not contain a complete accounting of injection wells, instead only listing injection "facilities" which may contain more than one injection well. Upon request, COGCC staff provided a more complete dataset listing 885 injection wells (346 disposal wells and 539 enhanced recovery wells), significantly more than the 701 classified as injection wells in the publicly accessible dataset.

8 Colorado Oil and Gas Conservation Commission. "Rule 324B. Aquifer Exemptions – Complete Rules as of May 1, 2018" https://cogcc.state.co.us/documents/reg/Rules/LATEST/Complete%20Rules%20as%20of%20May%201,%202018.pdf

9 For a discussion of why existing aquifer exemption criteria are inadequate, see "Citizen Petition to Repeal or Amend the EPA's Aquifer Exemption Regulations to Protect Underground Sources of Drinking Water" https://www.cleanwateraction.org/files/SDWA%20Aquifer%20Exemption%20Petition%20-%20NRDC%20et%20al%20-%203-23-2016.pdf

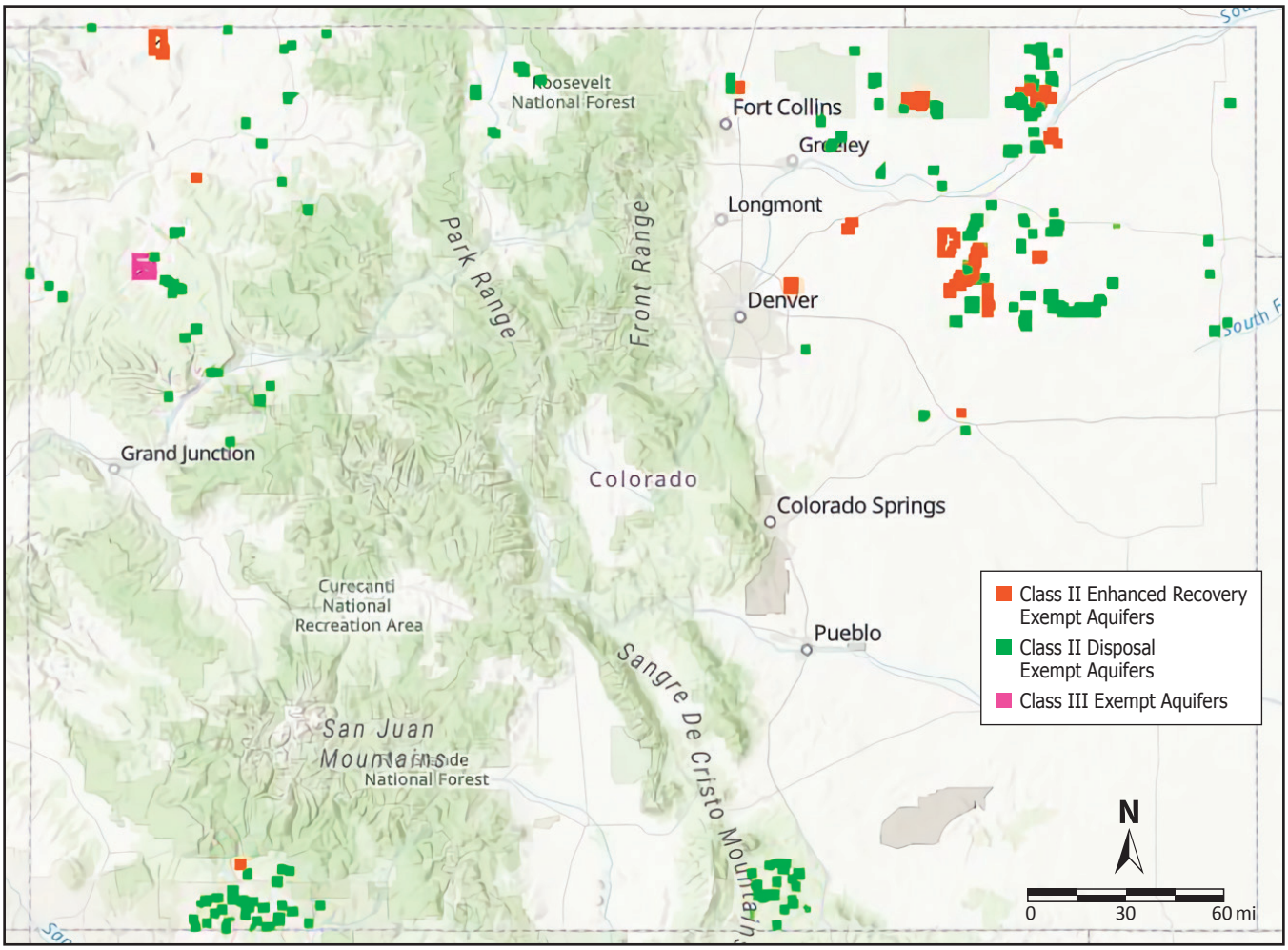


Map 1. Colorado Class II Injection Wells. Of the 939 Class II injection wells, the majority are used for disposal.

Based on the publicly accessible data and through information provided by COGCC staff, our analysis found the following:

- **COGCC lists 885 injection wells in the state.**
  - > 191 of these are located within the surface boundaries of exempt aquifers.[10]
    - — 66 are enhanced recovery wells
    - — 125 are disposal wells
  - > 748 are located outside the boundaries of exempt aquifers.
    - — 473 are enhanced recovery wells
    - — 221 are disposal wells.
- **The COGCC injection well data set does not list water quality of the injection zone for each well. Further review of salinity levels of the injections zones for all wells located outside of exempt aquifers is needed and would require analyzing UIC permits on a case by case basis.**

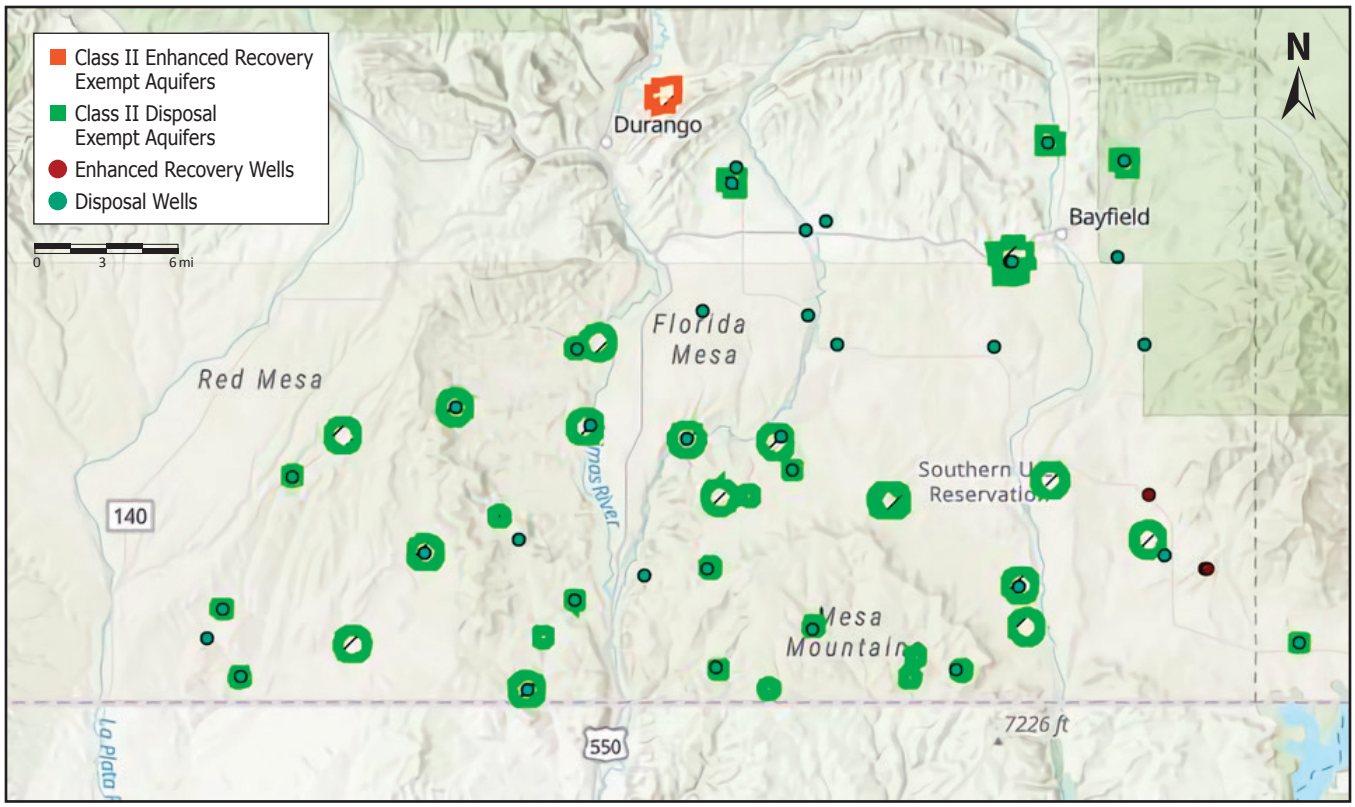
10 This analysis did not evaluate depth of injection zones compared to exempt aquifers in order to determine whether or not injection is actually occurring in the exempted zone.



Map 2. Exempt Aquifers in Colorado. The majority of exempt aquifers are designated for disposal of oil and gas waste.

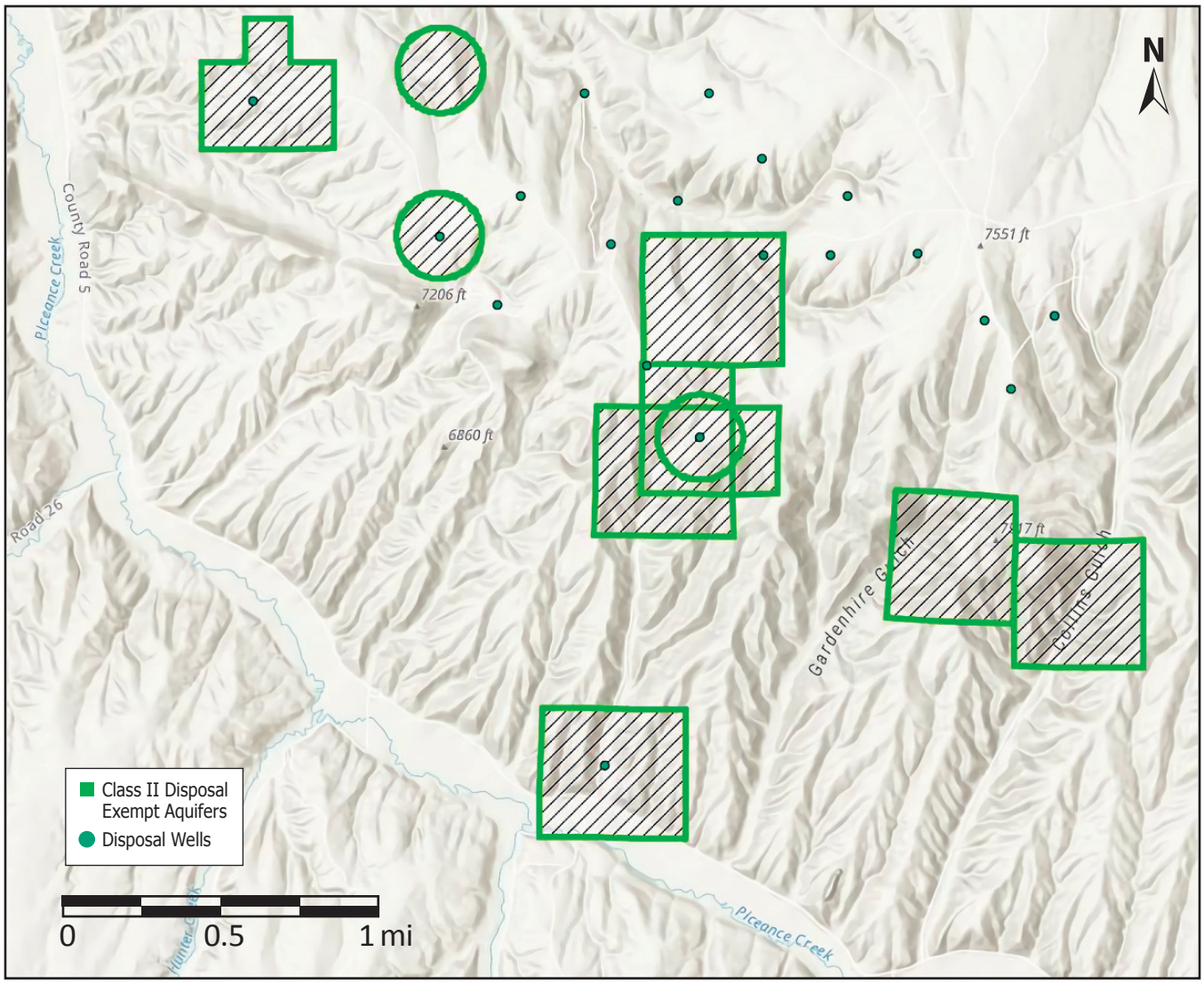
COGCC does not keep an inventory of exempt aquifers. The following information is based on EPA's exempt aquifer database.

- **There are 292 total exempt aquifers in Colorado.**
  - > 257 are designated for disposal of oil and gas wastewater
  - > 32 are designated for enhanced oil recovery
  - > 2 are designated for Class III uranium mining.
- **70 of Colorado's exempt aquifers are on tribal land and therefore under EPA jurisdiction. 222 are on state land and therefore likely were requested by the COGCC under its Class II primacy authority.**



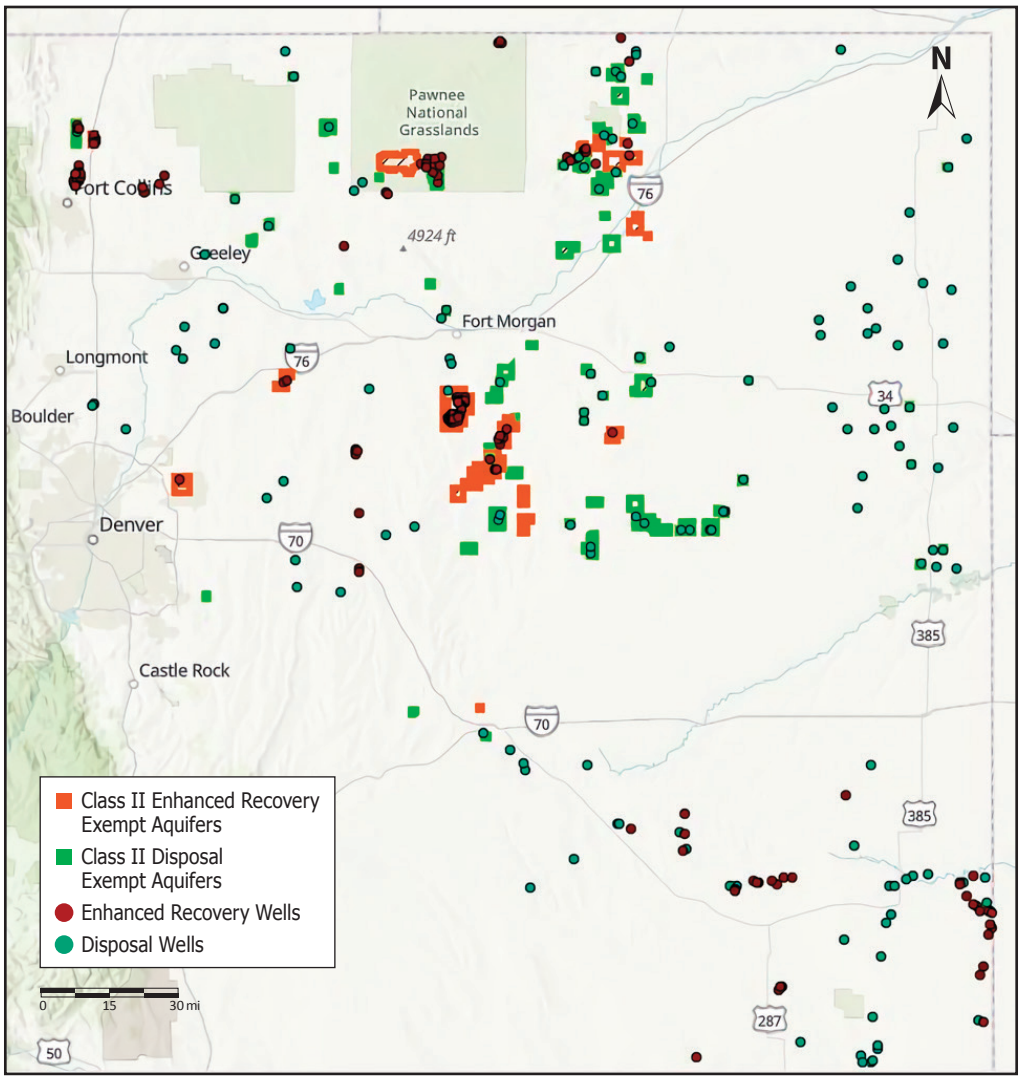
Map 3. Southern Ute Reservation. Injection wells and exempt aquifers on tribal land are directly regulated by EPA. The Southern Ute Reservation contains several injection wells and exemptions, the majority of which are based on a fixed radius around individual disposal wells.

- **Data quality for many of the exempt aquifers is poor.**
  - > 3 do not include location beyond county name and therefore were not included in the attached maps or any geographical analyses.
  - > 56 have either imprecise location or missing attributes in the data.
  - > There is no water quality information publicly listed for any aquifer exemption, such as salinity levels of the exempt formations. Formation water quality is necessary information in order to determine applicability of exemption criteria.
- **The majority of exempt aquifers appear to have spatial areas defined by either a fixed radius or rectangle. Only a small number have areas that indicate unique geologic analysis was conducted to determine the boundaries.**



Map 4. Piceance Creek. The exemptions in this area appear to be based on rectangular and fixed radius boundaries. Additionally, some of these exemptions do not contain active injection wells, and several injectors are located directly adjacent to the exemptions. This raises questions about the geologic analysis for these exemptions. Map 3 above raises similar questions as neither regions' exemptions appear to based on geologic conditions. Overlapping exemptions indicate injection formations at varying depths.

- **Data on formation thickness is missing for 55 exemptions and 8 list thickness as "less than 10" (no units given).**
- **Aquifer exemptions have been issued consistently over the last 34 years. 49 were issued in 1984 when the state obtained Class II primacy and at least 50 have been issued in each decade since.**
- **118 of the Class II exempt aquifers do not contain an injection well that is listed in the available dataset, likely a result of the injection well dataset only including active wells or missing information. This means that based on available data, we do not know the extent to which these exempt aquifers have actually been used as injection zones.**



Map 5. Northeast Colorado Exemptions and Injection. This region is home to significant injection activity, both enhanced recovery and disposal and several exemptions. Many exemptions do not contain active injection wells.

Conclusion

Exempting a potential drinking source from federal protection and essentially handing it over to the oil and gas industry is an outdated and short sighted concept. Former Editor in Chief of the *American Water Works Association Journal* described aquifer exemptions as a program that should "snap your head around and have you paying attention to this topic."[11]

Neither COGCC's, nor EPA's approach to exempting aquifers takes into account shifts in precipitation patterns, changing water availability, population changes and growth, and increased drinking water demands. For example, the National Climate Assessment described multiple threats to drinking water in the Colorado region, including declining snowpack and recurrent drought in certain areas.[12]

Despite these warnings, the oil and gas industry is expanding drilling operations. Record oil and gas production creates massive volumes of chemically laced and saline wastewater. Safely managing and disposing of this

11 McGuire, Michael J. "Supplies of All Types: Blue to Gray" American Water Works Association Journal. September 2015.

12 U.S. Global Change Research Program. "The Fourth National Climate Assessment." https://nca2018.globalchange.gov/chapter/25/

wastewater is an ongoing challenge for the industry. Operators continue to look for low-cost disposal options and this could leave more Colorado aquifers vulnerable to the exemption process.

Recommendations for COGCC:

- **Improve data management systems to make locations and attributes of all injection wells readily available.**
- **Develop an inventory of exempt aquifers and work to fill missing and incomplete data.**
- **Review all exemptions and compile all supporting documents, including geologic analyses. Post online for public access.**
- **Review and reform "Rule 324B. Aquifer Exemptions." At a minimum, COGCC must examine and reform the exemption criteria, and update the approval process to require a public hearing, consultation with stakeholders and a positive determination by COGCC prior to sending an application to US EPA.**
- **For any exemptions that are based on a fixed radius or rectangle, reapply to EPA based on actual geologic conditions.**
- **Evaluate exemptions that have no active injection wells and review applicability of exemption criteria.**
- **Evaluate federal aquifer exemption criteria and consider a more rigorous standard that aligns with actual and future water and population conditions in the state.**

Recommendations for EPA:

- **Review Colorado exemptions for consistency with criteria and process. Publicly post the supporting documents and statements of basis for each exemption.**
- **Review and consider updating the memorandum of agreement with COGCC to clarify aquifer exemption approval process, and data management.**
- **Continue to improve inventory and map of exemptions by pursuing data that is incomplete or missing.**
- **Seek increased budget for the UIC program through a funding request to Congress, in order to improve oversight of state programs, including aquifer exemptions.**

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